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Kaskattama, Manitoba Dating Report

Introduction

Eight samples collected from Kaskattama River area, near the coast of Hudson Bay in northeastern Manitoba by Tyler Hodder and Martin Ross were submitted to PALEOTEC Services for preparation for AMS radiocarbon dating. **Table 1** and **Table 2** lists the samples that were submitted for AMS dating and **Table 3** and **Table 4** shows the AMS ^{14}C dating results. Figures 1 through 9 provide photographic records of the fossil shells and wood that were dated prior destructive analysis in AMS radiocarbon dating.

Method

Plastic bags containing selected articulated marine valves, and single valves, along with isolated wood were all treated similarly in preparation for AMS radiocarbon dating. The shells and wood were initially cleaned in tap water using a gentle spray to remove loose adhering sediment. The shells were further cleaned in an ultrasonic bath. The cleaned valves and wood were dried and prepped for photography. Two wood fragments were sub-sampled submitting smaller pieces for dating. Photographs were obtained using a Nikon Coolpix 4500 digital camera mounted on a tripod.

Three bulk samples, 112-16-419-B01, 112-16-429-A02 and 112-16-435-A02 containing shells within sediment required processing in warm tap water using a swirling technique. Water was gently sprayed along the sides of a large beaker creating a vortex of lighter weight material. This lighter fraction was decanted onto nested sieves of 20 and 40 mesh Canadian Standard Tyler series (mesh openings: 0.85 mm and 0. 425 mm respectively). All material greater than 0.425 mm was examined using a binocular microscope isolating shells for identification. The rock/sand/silt fraction was briefly scanned and discarded.

After photographing the desired shells and wood for AMS dating, larger bivalves were further cleaned using a Dremel moto-flex, variable speed tool (Model 332) outfitted with an aluminum oxide grinding bit. To avoid cross-contamination of the carbonate material, new grinding bits were used for each shell grinding. Sterile disposable latex gloves were worn during this procedure and disposed after each shell grinding. The outer chalky layer and any secondary carbonates were removed by grinding both the dorsal and ventral surfaces of the shell revealing the inner nacre. Nacre is the preferred carbonate material when dating shells. For short-lived molluscs that only live for approximately 15 years such as *Hiatella arctica*, the thickest nacre fragment e.g. the hinge was preferred over the perimeter of the valve. The cleaned shell fragments and wood were inspected and wrapped in freshly-cut aluminum tin foil packets and placed in labeled, sterile, plastic petri dishes (3.5 cm in diameter) in preparation for shipment to the dating facility.

All samples were AMS radiocarbon dated by the Keck Carbon Cycle AMS Lab, University of California, Irvine.

Identification and Discussion

Identification of the marine molluscs was aided by the use of Wagner (1984) illustrated catalogue of the Mollusca. The majority of dated shells from the Kaskattama samples were identified as Arctic Hiatella (*Hiatella arctica*) bivalves. This species is a suspension feeder catching particles of food as it passes by. The type of substratum selected by juveniles determines whether they become burrowers or nestlers. Those settling on hard rock will attach by thread-like hairs (byssus threads) and become nestlers while juveniles settling on soft rock become burrowers. The adults are able to bore into rock by mechanical abrasion using the valves of the shell.

Articulated bivalves of *Hiatella arctica* occur in samples 112-16-408-A1 (**Figure 1**) and 112-16-423-A04 (**Figure 5**). Single valves and almost complete valves occur in samples 112-16-423-A01 (**Figure 3**), 112-16-429-A02 (**Figure 6**), and 112-16-435-A02 (**Figure 7**). Sample 112-16-423-A04 contained many valves of *Hiatella arctica* (**Figure 4**) including an articulated bivalve in which one valve was submitted for dating.

Five valves of Arctic nutclam, (*Portlandia arctica*) with intact periostracum (**Figure 2**) were isolated in sample 112-16-419-B01. The valves, upon cleaning, became very fragile with the shell valve breaking away from

the periostracum. The small, thin shell fragments were submitted for AMS radiocarbon dating. This sample also contained a fragment of a marine Hydrozoa (*Obelia* sp.) perisarc (**Figure 10**).

Sample 112-16-429-A02 also contains other shells including barnacle and snail fragments and reworked Paleozoic crinoid (**Figure 11**).

Wood/branch samples 112-16-416-F3 and 15112TH407A04 are from sub-till organic-bearing units (**Figure 8** and **Figure 9**). The ^{14}C dates on these samples yielded young and non-finite ages of 65 ± 15 yr BP (112-16-416-F3) and >51,200 (15112TH407A04).

Reference:

Wagner, F.J.E., 1984. Illustrated catalogue of the Mollusca (Gastropoda and Bivalvia) in the Atlantic Geoscience Centre Index Collection, Geological Survey of Canada, Ottawa, Ontario, Canada, pp. 76.

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Table 1. Martin Ross (Univ. of Waterloo) five shell samples for AMS dating. No optional IRMS 13C measurements. Invoice directly for $1200.00US.			
#	Sample No.	Material for AMS/Comments	Est. age (yr BP)
1	112-16-408-A1	articulated Hiatella arctica valve	Holocene
2	112-16-419-B01	Portlandia arctica shell fragments **FRAGILE** (small frgs.)	Holocene
3	112-16-423-A01	incomplete Hiatella arctica valve	Holocene
4	112-16-423-A04	articulated Hiatella arctica valve	Holocene
5	112-16-429-A02	Hiatella arctica valve	Holocene
	Total 5		

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Table 2. Tyler Hodder (Manitoba Geological Survey) two organic samples and one carbonate sample for AMS dating. No optional IRMS 13C measurements. Invoice directly for $840.00US.			
#	Sample No.	Material for AMS/Comments	Est. age (yr BP)
1	112-16-435-A02	Hiatella arctica valve	Holocene
2	112-16-416-F3	wood fragment	mid-Wisc./older
3	15112TH407A04	wood fragment	mid-Wisc./older
	Total 3		

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John: For invoicing please put "**Kaskattama Quaternary – Tyler Hodder**" on the invoice. Thank you!

Table 3.

KECK CARBON CYCLE AMS FACILITY

EARTH SYSTEM SCIENCE DEPT, UC IRVINE

^{14}C results | Paleotec/Ross | Feb 18 2017

UCIAMS #	Sample name	Other ID	d^{13}C (‰)	±	fraction Modern	±	D^{14}C (‰)	±	^{14}C age (BP)	±
184552	112-16-408-A1				0.4102	0.0007	-589.8	0.7	7160	15
184553	112-16-419-B01				0.3449	0.0006	-655.1	0.6	8550	15
184554	112-16-423-A01				0.3724	0.0006	-627.6	0.6	7935	15
184555	112-16-423-A04				0.3744	0.0006	-625.6	0.6	7890	15
184556	112-16-429-A02				0.3797	0.0006	-620.3	0.6	7780	15

Radiocarbon concentrations are given as fractions of the Modern standard, D^{14}C, and conventional radiocarbon age, following the conventions of Stuiver and Polach (Radiocarbon, v. 19, p.355, 1977).

Sample preparation backgrounds have been subtracted, based on measurements of ^{14}C-free wood (organics) and calcite (shells).

All results have been corrected for isotopic fractionation according to the conventions of Stuiver and Polach (1977), with δ^{13}C values measured on prepared graphite using the AMS spectrometer. These can differ from δ^{13}C of the original material, if fractionation occurred during sample graphitization or the AMS measurement, and are not shown.

Comments:

Table 4.

KECK CARBON CYCLE AMS FACILITY

EARTH SYSTEM SCIENCE DEPT, UC IRVINE

^{14}C results | Paleotec/Hodder | Feb 18 2017

UCIAMS #	Sample name	Other ID	d^{13}C (‰)	±	fraction Modern	±	D^{14}C (‰)	±	^{14}C age (BP)	±
184557	112-16-435-A02				0.3810	0.0006	-619.0	0.6	7750	15
184561	112-16-416-F3				0.9919	0.0017	-8.1	1.7	65	15
184562	15112TH407A04				0.0001	0.0008	-999.9	0.8	>51200	

Radiocarbon concentrations are given as fractions of the Modern standard, D^{14}C, and conventional radiocarbon age, following the conventions of Stuiver and Polach (Radiocarbon, v. 19, p.355, 1977).

Sample preparation backgrounds have been subtracted, based on measurements of ^{14}C-free wood (organics) and calcite (shells).

All results have been corrected for isotopic fractionation according to the conventions of Stuiver and Polach (1977), with δ^{13}C values measured on prepared graphite using the AMS spectrometer. These can differ from δ^{13}C of the original material, if fractionation occurred during sample graphitization or the AMS measurement, and are not shown.

Comments:
The 14C/C ratios for the 15112TH407A04 sample was within 2 standard deviations of zero after background subtraction.
The corresponding radiocarbon age is quoted as a 2 sigma lower limit.

Figure 1. Sample 112-16-408-A1. Opposite views of *Hiatella arctica* articulated bivalve. One valve was AMS radiocarbon dated providing a ^{14}C age of **7160 ± 15 yr BP** (UCIAMS-184552) (Feb. 18, 2017).

Figure 2. Sample 112-16-419-B01. Arctic nutclam, (*Portlandia arctica*) bivalves with intact periostracum. For scale, the bottom blue and white grid lines are 1 cm. The thin, fragile shell fragments (excluding the periostracum) were AMS radiocarbon dated providing a ^{14}C age of **8550 ± 15 yr BP** (UCIAMS-184553) (Feb. 18, 2017).

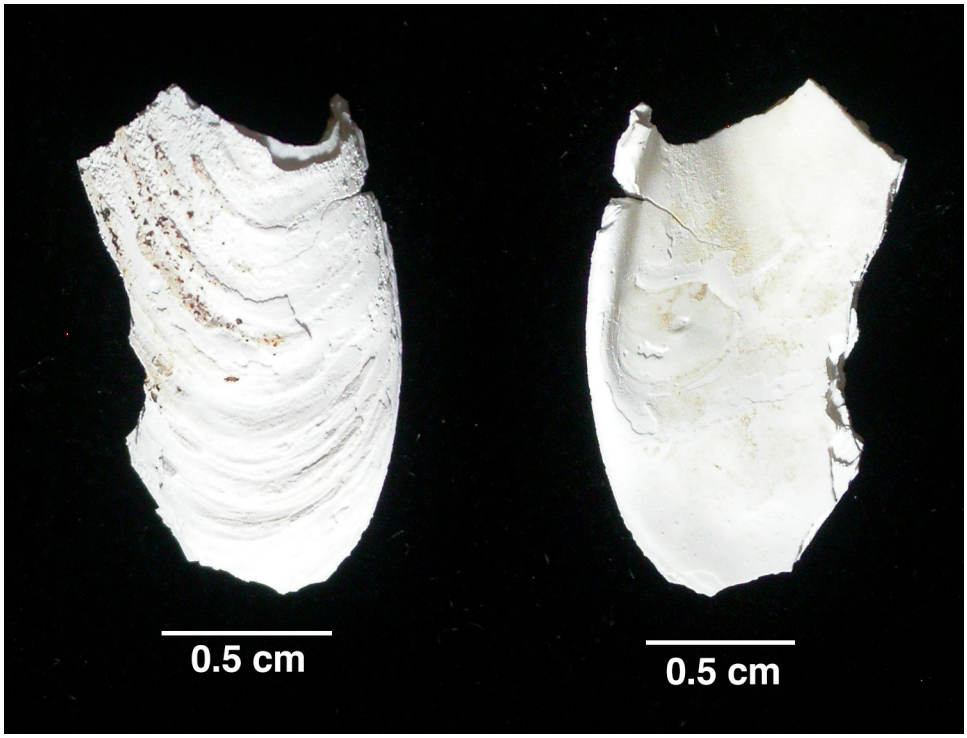

Figure 3. Sample 112-16-423-A01. Dorsal and ventral view of one, nearly complete *Hiatella arctica* valve was AMS radiocarbon dated providing a ^{14}C age of **7935 ± 15 yr BP** (UCIAMS-184554) (Feb. 18, 2017).

Figure 4. Sample 112-16-423-A04. Opposite views of *Hiatella arctica* valves. For scale, white and blue gridlines are 1 cm.

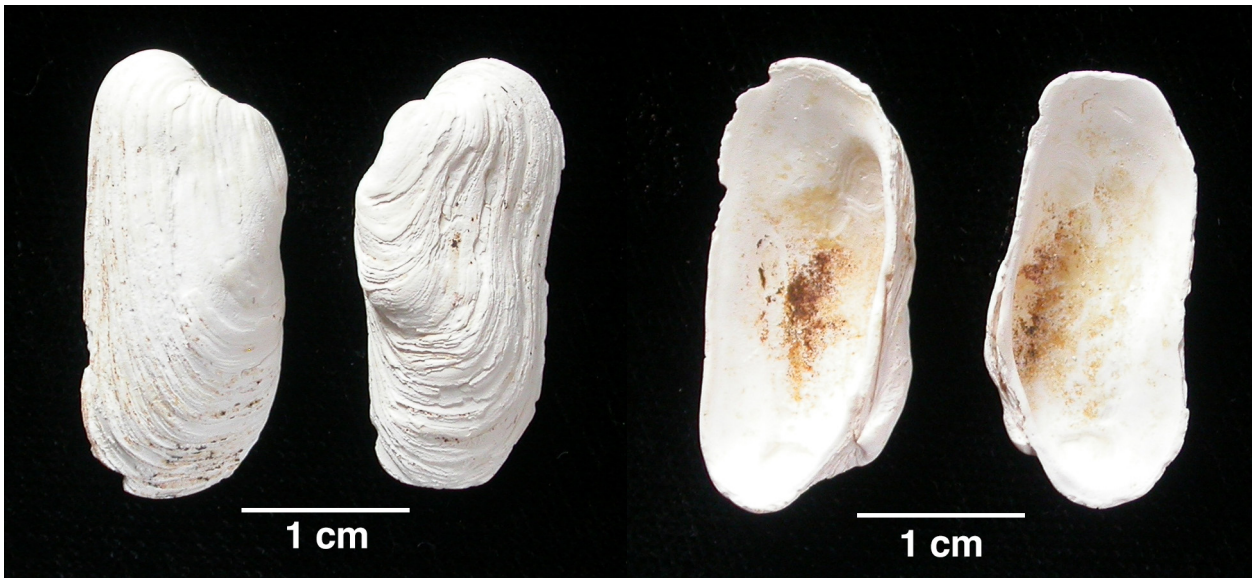

Figure 5. Sample 112-16-423-A04. Opposite views of an articulated *Hiatella arctica* bivalve. One valve was AMS radiocarbon dated providing a ^{14}C age of **7890 ± 15 yr BP** (UCIAMS-184555) (Feb. 18, 2017).

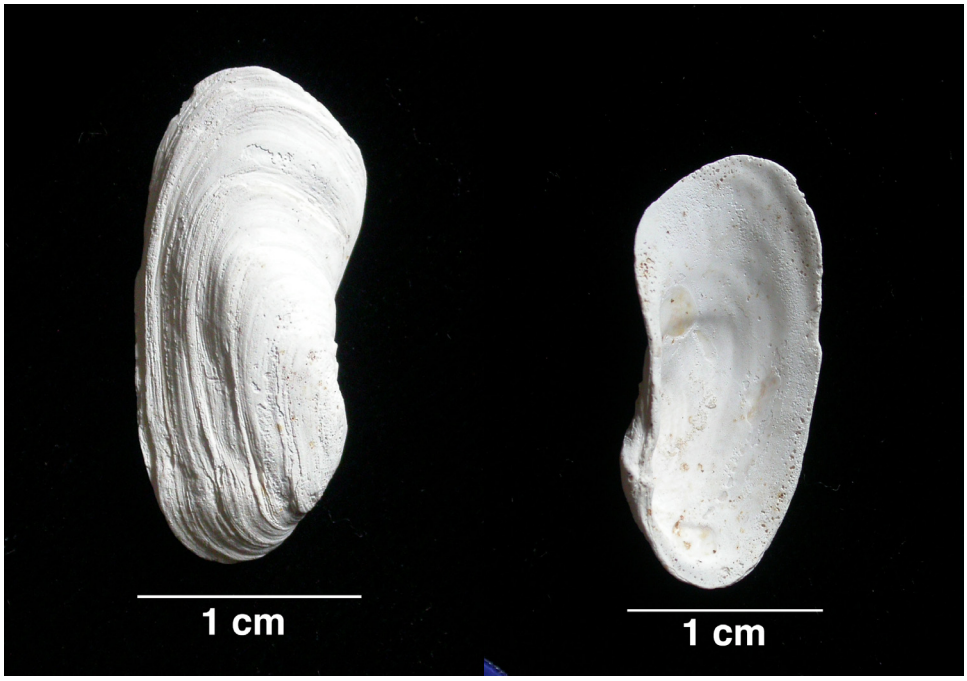

Figure 6. Sample 112-16-429-A02. Opposite views of *Hiatella arctica* valve. This valve was AMS radiocarbon dated providing a ^{14}C age of **7780 ± 15 yr BP** (UCIAMS-184556) (Feb. 18, 2017). This sample also contained gastropod shell fragments, barnacle shell fragments and one Paleozoic crinoid.

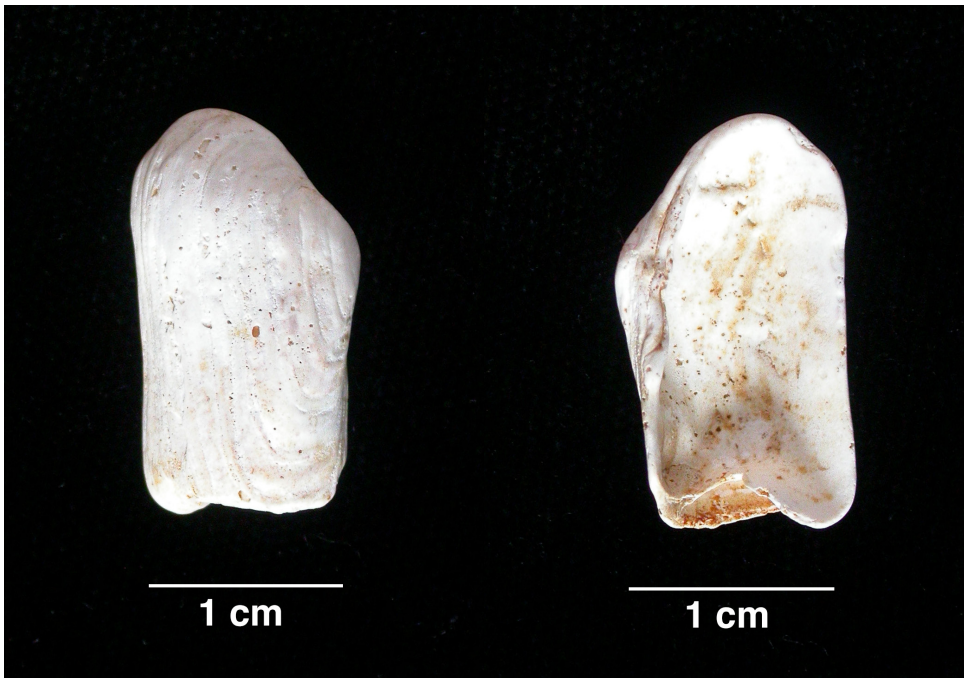

Figure 7. Sample 112-16-435-A02. Dorsal and ventral view of an almost complete *Hiatella arctica* valve. This valve was AMS radiocarbon dated providing a ^{14}C age of **7750 ± 15 yr BP** (UCIAMS-184557) (Feb. 18, 2017).

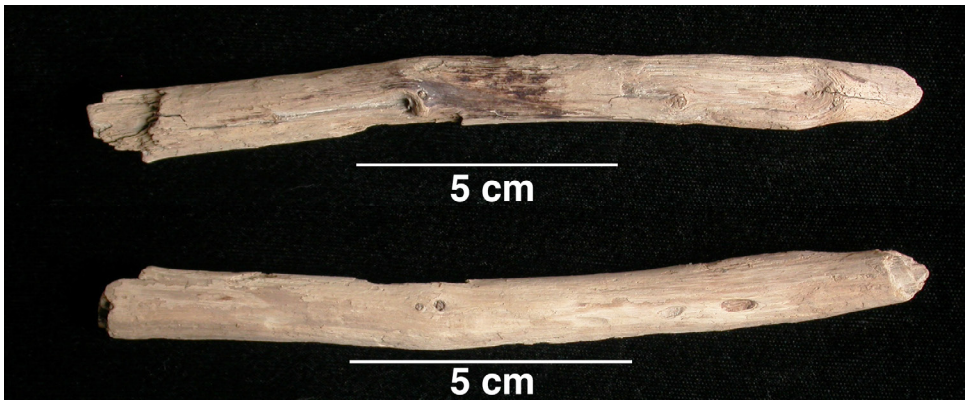

Figure 8. Sample 112-16-416-F3. Opposite views of branch fragment. A subsample of the branch was AMS radiocarbon dated providing a young ^{14}C age of **65 ± 15 yr BP** (UCIAMS-184561) (Feb. 18, 2017).

Figure 9. Sample 15112TH407A04. Opposite views of branch fragment. A subsample of the branch was AMS radiocarbon dated providing a non-finite ^{14}C age of **>51,200 yr BP** (UCIAMS-184562) (Feb. 18, 2017).

Figure 10. Image of modern hydrozoan, *Obelia dichotoma* colony showing the brown perisarc (chitinous outer layer surrounding much of the colonial hydroid) on older sections of the colony. This species is common in protected marine waters attached to pilings, eelgrass, mussels, barnacles, seaweed, or debris. Sample 112-16-419-B01 contained an *Obelia* sp. perisarc fragment.


Figure 11. Image of Paleozoic 'sea lily' crinoids. Sample 112-16-429-A02 contained one reworked Paleozoic crinoid.